

# Healthcare in a carbon-constrained world

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## Abstract

**Objective.** The climate crisis necessitates urgent decarbonisation. The health sector must address its large carbon footprint. In the present study, we sought healthcare thought leaders' views about a future environmentally sustainable health system.

**Methods.** The present study was a qualitative exploratory study consisting of semistructured, in-depth interviews with 15 healthcare thought leaders from Australia, the UK, the US and New Zealand. Audio recordings of the interviews were transcribed and analysed by matrix display and thematic analysis.

**Results.** Overall, healthcare thought leaders believe that to reduce the carbon footprint of healthcare we need to look beyond traditional 'green' initiatives towards a more fundamental and longer-term redesign. Five main themes and one 'key enabler' (information communication technology) were identified. In this paper we draw on other relevant findings, but chiefly focus on the fifth theme about reshaping the role of healthcare within society and using the size and influence of the health sector to leverage wider health, environmental and societal benefits.

**Conclusions.** These ideas represent potentially low-carbon models of care. The next step would be to pilot and measure the outcomes (health, environmental, financial) of these models.

**What is known about the topic?** The health sector needs to reduce its large carbon footprint. Traditional 'green' initiatives, such as recycling and improving energy efficiency, are insufficient to achieve the scale of decarbonisation required.

**What does this paper add?** Healthcare thought leaders surveyed in the present study suggested that we also consider other, non-traditional ways to achieve environmental sustainability. In this paper we discuss their ideas about adopting an anticipatory approach to healthcare using predictive analytics, and using the size and influence of the health sector to effect wider health and environmental benefits.

**What are the implications for practitioners?** Achieving an environmentally sustainable healthcare system is likely to require broad and fundamental (i.e. transformational) change to the current service model. Health practitioners throughout the sector must be closely engaged in this process.

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## Introduction

In 2015, 195 countries historically committed to limiting the global temperature increase to below 2°C (and ideally below 1.5°C) above pre-Industrial levels.<sup>1</sup> To achieve this collective goal, the world will need to decarbonise.<sup>2</sup> Data from Britain and the US demonstrate that their healthcare systems are highly resource intensive and have substantial carbon footprints.<sup>3,4</sup>

In the UK, pioneering research found that the components of the National Health Service's (NHS) carbon footprint were building energy use (18%), travel (patient, staff, visitor; 13%) and procurement (57%; although 11% of this was commissioned services from outside the system).<sup>3</sup> The key message from this research was that traditional 'green' initiatives, such as improving energy efficiency and implementing staff travel plans, are only one part of the solution. In Britain, the *Climate Change Act* (c.27; London Parliament of the United Kingdom 2008) mandates

carbon reduction of 80% (based on 1990 levels) by 2050. To achieve this scale of decarbonisation, the 'procurement' component also needs to be radically reduced. Because the procurement footprint, which consists of pharmaceuticals, medical instruments and equipment, business services etc.,<sup>3</sup> reflects the current practice of resource-intensive healthcare, we need to consider entirely new models of care to transform the health system. A national unit within the NHS has been tasked with leading this process of transformational change in order to meet the British Government's carbon reduction requirements<sup>5</sup> ([www.sduhealth.org.uk](http://www.sduhealth.org.uk), accessed 20 April 2018).

Although the carbon footprint of the Australian health system has not yet been measured, it is likely that the challenge in this country is similar to that in the UK. However, it is not clear what a transformed health system would look like. In the present study, the views of Australian and international healthcare

thought leaders about a future environmentally sustainable health system were sought.

## Methods

A series of qualitative, semistructured interviews were conducted via Skype, telephone or face to face with Australian and international thought leaders. The sampling of interviewees was purposive.<sup>6</sup> The criteria for inclusion were as follows: (1) health professionals whose innovative and visionary thinking and/or experience set them apart from the mainstream ‘managerial’ mindset in healthcare; and (2) either specialist knowledge in a relevant field, senior level management experience or being the first author of a seminal publication in the field. The interview guide was developed based on previously verified questions<sup>7,8</sup> and refined after two pilot interviews. Of the six core interview questions, the three questions relevant to the topics of this paper are listed below.

1. What do you think are the strengths and weaknesses of the current healthcare system?
2. What would an environmentally sustainable health system look like? What would be the underpinning values?
3. Do you know of any examples of elements of this environmentally sustainable system which already exist?

The interviews were semistructured, with the in-depth and narrative enquiry interviewing techniques used,<sup>6,9,10</sup> and interviews were continued until data saturation.<sup>6</sup> Audio recordings were transcribed and an iterative process of thematic analysis was undertaken.<sup>9,11,12</sup> Van Manen’s selective approach was used to highlight essential or revealing statements or phrases in each of the transcriptions;<sup>13</sup> these data extracts were then entered into the first matrix and themes were identified and refined using further matrices.<sup>11,12</sup> Four of the audio recordings (>25%) were independently analysed by a second person (MJ) for validity.<sup>6</sup>

Ethics approval for this research was provided by the University of Canberra Human Research Ethics Committee (Project no. 14-231).

Of the 20 healthcare thought leaders invited to interview, two declined, two failed to respond (despite follow-up) and one withdrew a short time before their interview for personal reasons. Thus, the response rate was 75% (15/20) and 14 interviews were conducted (there was one joint interview). Six interviewees were from Australia, five were from the UK, three were from the US and one was from New Zealand. The interviews were conducted either by telephone ( $n=9$ ), Skype ( $n=4$ ) or face to face ( $n=1$ ) from May to November 2015. To maintain the confidentiality of interviewees, they are identified by numbers known only to the researchers.

## Results and Discussion

The most significant finding from the UK research was that although ‘green’ initiatives are important, they are improvements; that is, measures that develop and extend the existing systems.<sup>14</sup> Improvements alone are patently insufficient to achieve the scale of decarbonisation required in the health sector (*Climate Change Act* (c.27) London Parliament of the United Kingdom 2008). Instead, we must recognise that the very model of healthcare in the UK is carbon intensive and so

a new system of delivering health services is required. This is transformation: a fundamentally new way of doing things that arises in response to changing conditions, new knowledge and/or new societal priorities and values.<sup>14,15</sup>

Because comparable data are not yet available for the Australian health system, we inferred that the challenge of transformation is likely to be similar in the health systems of other developed countries, including Australia.

In the present study, participants were selected not because of any particular expertise in environmental sustainability, but rather for their previously demonstrated ability to think creatively and innovatively about transformation in the field of healthcare. We thought that posing this question ‘What would an environmentally sustainable health system look like?’ to some of the leading thinkers in this field would be a useful exploratory study.

### Thematic findings

Five overarching themes were identified in the present study. Several of the themes were closely interconnected. Information communication technology (ICT) was identified as a ‘key enabler’ in the present study because it was a topic that interviewees discussed in relation to other themes, predominantly in the context of enabling, or facilitating, other care delivery models. The first theme was Green Healthcare and the second was Prevention and Primary Care. The third and fourth themes (Value, and People and Relationships respectively) were about the concept of value in healthcare and using human resources and human interactions as low-carbon sources of value; these are discussed in another paper.<sup>16</sup> In this article, we draw on relevant aspects of the first four themes and ICT to discuss population health management and an anticipatory approach to healthcare. This leads into the fifth theme, Health Systems Within Societal Systems, which is about reshaping the role of healthcare within society, and this discussion is illustrated with emerging international examples.

### Redesigning healthcare

Interviewees suggested a fundamental reorganisation within healthcare: much broader primary and community care, with vertical and horizontal integration of hospitals, all facilitated by sophisticated ICT. This is the future that some major healthcare systems are preparing for. Ezekiel Emanuel, one of the ‘architects’ of the Affordable Care Act in the US, has said publicly, ‘I think it’s inevitable that most care will move out of hospitals’ and cited two reasons: first, an increase in primary care and wellness and second the advent of digital medicine and internet interactions.<sup>17</sup> In the US, there is evidence that healthcare systems are moving towards a population health management (PHM) approach.<sup>18</sup>

In the PHM approach, primary care would move from face-to-face visits towards telephone and email consultations, group visits and encounters with a variety of care team members.<sup>18</sup> Interviewees said that care would be genuinely designed around patients, as in Interviewee 13’s organisation, where:

...[the] customer [patient] stays in place if at all possible. . . you cannot afford to shuttle customers from place to place.

Health organisations will coordinate care across settings, use centralised resource planning, provide continuous care, provide patient self-management education and focus on health behaviour and lifestyle changes.<sup>18</sup>

#### *An anticipatory approach*

While advocating for this type of approach, interviewees recognised that this model of care (i.e. community based, person centred, focused on wellness) requires providers to maintain regular contact with patients and to have access to relevant data. They called for a much more anticipatory approach to healthcare: a system that understands much more about people.

Interviewee 13 said that many models of healthcare, in their approach to patients:

*...were trying to sort people, regardless of their preference, their culture, their context or their situation...it would say, 'all the diabetics over here, all the people with Parkinson's go over there, all the people with strokes over here'...It would sort them based really on disease categories.*

However, people's preferences, experience, social support, employment status etc. all influence their lifestyles and their ability to adapt and cope, and therefore their health outcomes.

*So what we really need to get good at...are the very same things that social media [e.g. Amazon, Google and Facebook] has done very well: they have said...we want to understand you...if you really, really thought about it, around the customer completely, Facebook is a great model. [Interviewee 13].*

Interviewee 13's organisation has a personal health record, a smartphone app and is working towards automated reminders, self-scheduling and collecting social demographic information ('about what it's like to live in your neighbourhood'). Similarly, Interviewee 15's organisation is currently:

*...overlaying...those clinical outcomes over the top of [geographic information system (GIS)] maps showing the population health study: education, housing, robberies, high school graduation rates, schools with high proportion of free and reduced lunch...so that we can actually use predictive analytics not only around clinical conditions but around population health conditions that will let us know how we're doing more broadly...*

Interviewee 15 said that:

*...predictive analytics will continue to allow the primary care physician to make even better choices...as well as our department on where we should be making investments on the determinants of health.*

However, the key question for the present study is, of course, would these approaches be low carbon? Essentially, there are two key concepts here: prevention of illness and ICT. Given the substantial carbon and resource costs of healthcare, prevention of illness is highly likely to entail lower carbon costs. As Interviewee 1 said:

*...actually the most environmentally sustainable thing would be to not have people get sick in the first place!*

Similarly, Interviewee 10 said that the key question is:

*How could we get better health from less healthcare? How can we get more health, and more fairness, from less healthcare and better healthcare?*

Although less clear, there is now growing evidence that the effective use of ICT could also reduce carbon costs. For example, the British Sustainable Development Unit recently conducted evidence-based modelling to demonstrate that several different interventions, including 'teleconferencing' and 'telehealth/telecare for long-term conditions', led to carbon and financial savings.<sup>19</sup>

#### *Healthcare systems within societal systems*

Overall, then, a fundamental redesign of healthcare with low-carbon potential, facilitated by sophisticated ICT, is emerging. However, as several interviewees pointed out, this would be only part of the solution because healthcare systems operate both within and in connection with societal systems. Interviewee 7 said:

*I'm not sure what [healthcare] would look like, but it would be nested within an environmentally sustainable planet...*

Interviewee 10 posed the question:

*What is the business model for an organisation involved in health and care?*

That is, what is the appropriate role for healthcare within society? In the analysis, this concept of 'healthcare systems within societal systems' was identified as an overarching theme (Theme 5). Within this theme, thought leaders proposed two key approaches: (1) 'anchor institutions'; and (2) using healthcare to lead and influence other sectors ('the health sector as a leader').

#### *Anchor institutions*

Social, economic and environmental factors are more significant predictors of health than access to care (only 10–20% of what creates health is related to actual healthcare).<sup>20,21</sup> The economic activity of the hospital sector is significant: in the US, it is estimated to be more than US\$780 billion annually.<sup>22</sup> Institutions such as hospitals, universities and local government organisations ('Eds and Meds') usually have permanent aims, invested capital and relationships (with customers, employees and vendors) in their communities. Therefore, they have a 'vested self-interest in helping to ensure their communities are safe, vibrant, healthy, stable'.<sup>22</sup> 'Anchor mission' is an approach in which these 'anchor institutions' use their business and non-clinical practices (e.g. purchasing, hiring, investments) to address the social determinants of health.<sup>22</sup>

Interviewee 15 cited US healthcare organisation Kaiser Permanente's Total Health framework.<sup>22</sup> This intentionally aligns all its resources (procurement, workforce development, investment capital, education programs, research, environmental stewardship and clinical prevention) to produce 'total health';

that is, to maximise the physical, mental and social well-being of its members and communities. Interviewee 15 cited several examples: workforce wellness initiatives, programs to access healthy foods and increase physical activity in thousands of schools, purchasing green energy and supplier diversity, such as using local firms and purchasing from women and minority-owned firms. (In 2014, Kaiser Permanente spent US\$1.5 billion with minority- and women-owned firms.<sup>23</sup>) In another example cited by Interviewee 12, a US healthcare organisation has a substantial training program for local young people:

*...so they have a different future, than when they came in to the program. Some would not have graduated from high school. ...[without] the support of the organisation.*

Interviewee 10 agreed:

*One of the interesting pieces of evidence about social value... is that not only does it improve [the] lot of the poorest paid, also it's probably the most effective way a healthcare system can reduce health inequalities...*

In the UK, the power of social value to reduce health inequalities has, in fact, been given legal backing. The Public Services (Social Value) Act, which came into force in January 2013, makes it a requirement for public service commissioners, including local authorities and health sector bodies, to consider social, economic and environmental benefits in procuring service contracts.<sup>24</sup>

Interviewee 15 said of the anchor institutions strategy:

*...this is where healthcare is going, and why these innovations are really exciting, because they are not only changing the local economy, and creating new jobs and all that, but we know those are the determinants of health, so if we're successful, we will not only improve health over time, but we may... be able to reduce preventable demand on the delivery system.*

There is, in fact, growing emerging evidence for this assertion: the English Sustainable Development Unit's analysis shows that initiatives such as 'reducing social isolation in older people' has demonstrable carbon and financial savings.<sup>19</sup> Further, Interviewee 15 also pointed out Total Health's connection with environmental sustainability:

*...when we start changing our housing and our transportation and our food... we're talking about environmental sustainability!*

which refers to the fact that many actions in these areas will have both health and direct environmental benefits.

#### *The health sector as a leader*

The second approach was using the size and influence of health organisations to leverage changes within the local economy and the wider health sector. Interviewee 14 said:

*[healthcare] is a big chunk of our economy, how is it going to help lead... the change around sustainability...*

Interviewee 15 cited Kaiser Permanente's purchase of 20 years' worth of futures in wind and solar energy, which is

helping shift the sector from carbon-based to wind and solar; they're 'building the market'. Although the actual reduction in carbon emissions may be relatively small, the Kaiser Permanente's leadership could be important:

*...even though we're big and use a lot of energy, us going clean and green... it's de minimis, it's not like we're going to cut climate change... But if we could move the sector that way, now we're talking some impact.*

#### *Study limitations and future research*

The present study was based on a small sample of thought leaders from just four countries. It was a study that explored ideas and opinions about this new field in healthcare and, as such, does not provide definitive 'solutions'. Rather, we hope that the study will extend the thinking and broaden the response to the decarbonisation challenge. Whichever avenues are pursued, one important task will be to develop appropriate outcome measures, including metrics for carbon costs, and then pilot and assess the new models.

As noted in the discussion about ICT, some early modelling in this area has recently commenced. The English Sustainable Development Unit has started to quantify the potential carbon and monetary savings from a range of initiatives,<sup>19</sup> including the traditional 'green' initiatives around energy efficiency and active staff travel. However, consistent with the findings of the present study, they are also looking beyond these initiatives to consider schemes that address the social determinants of health. For example, they are modelling the carbon and monetary savings from projects about reducing social isolation in older people and reducing fuel poverty through referrals for home insulation.<sup>19</sup> The next phase of work could adopt and/or adapt their methodology.<sup>19</sup>

#### **Conclusion**

Traditional 'green' initiatives will be insufficient to decarbonise our health systems. The ideas presented in this article, an anticipatory approach using predictive analytics, adopting anchor institution strategies and using the size and influence of the health sector to effect wider societal change, may be important in a low-carbon system of care. Whichever ideas are pursued, the next step should be to build upon the modelling started by the Sustainable Development Unit to measure the outcomes (health, social, environmental and financial) of these models. If they do provide clear benefits across those indicators, it would present a compelling case for change.

#### **Competing interests**

None declared.

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